3GPP TSG-RAN WG4 Meeting #112 R4-24xxxx

Maastricht, Netherlands, August 19th – 23rd, 2024

**Agenda item:** 6.1.3

**Source:** Ad-hoc chair (Intel Corporation)

**Title:** Ad-hoc minutes for NR positioning AH3 (Tuesday)

**Document for:** Approval

# Introduction

This document is the ad-hoc minutes for Rel-18 NR Positioning with the following threads covered.

|  |  |  |  |
| --- | --- | --- | --- |
| Email title | Topic areas | AI covered in the topic thread | Summary document |
| [112][210] NR\_pos\_enh2\_part1 | RRM core maintenance and performance requirements  - General - RedCap positioning - PRS/SRS BW aggregation | 6.1.1.1 (relevant tdocs) 6.1.1.4 6.1.2.1 (relevant tdocs) 6.1.2.4 6.1.2.5 | R4-2411805 |
| [112][211] NR\_pos\_enh2\_part2 | RRM core maintenance and performance requirements - SL Positioning - Carrier Phase Positioning | 6.1.1.1 (relevant tdocs) 6.1.1.2 6.1.2.1 (relevant tdocs) 6.1.2.2 6.1.2.6 | R4-2411806 |
| [112][212] NR\_pos\_enh2\_part3 | RRM core maintenance and performance requirements - LPHAP use case | 6.1.1.1 (relevant tdocs) 6.1.1.3 6.1.2.1 (relevant tdocs) 6.1.2.3 | R4-2411807 |

The recommendations after AH#3 is:

* Continue:
  + SL positioning core (was not discussed) in Topic #5
  + Topic #7 (not all CRs were discussed)
* Come back to:
  + Topic #4,
  + CPP core issue 2-1-1 in Topic #5
* On-line discussion needed in RAN4 RRM room:
  + CPP performance issue 2-2-2 and CPP core issue 2-1-3 (same issue)

1. Core requirements maintenance

## SL Positioning Core Requirements (AI 6.1.1.2 / [112][211] NR\_pos\_enh2\_part2)

### **Issue 1-1-1: End point of SL-PRS based RSTD measurement period requirements**

|  |
| --- |
| *Agreements in RAN4#110bis:*   * The SL RSTD measurement period ends after the UE has measured SL PRS resources from at least two different Tx UEs including target and reference UEs. * FFS whether any updates to the TS 38.133 are needed. |

* Proposals
  + Option 1: (Huawei)
    - Update the SL RSTD requirements to reflect that measurement period ends after the UE has measured SL PRS resources from at least two different Tx UEs.
* Discussion
* Agreements

### **Issue 1-1-2: Impact of Uu link connect**

* Proposals
  + Option 1: (Huawei)
    - RAN4 not to define any impact of Uu link connection on the measurement period.
* Discussion
* To check:
  + The issue was resolved in the last meeting, by adding Note 3 in the introduction part of SL positioning section.
* Agreements

### **Issue 1-1-3: Measurement period requirements for SL PRS-RSRP(P)**

* Proposals
  + Option 1: (Huawei)
    - Remove dedicated measurement period requirements for SL PRS-RSRP(P).
  + Option 2: (Ericsson)
    - Update the measurement period definition of SL PRS-RSRP and SL PRS-RSRPP to refer to SL RSTD, SL Rx-Tx, SL AoA, and SL RTOA, depending on which of them the SL PRS-RSRP and SL PRS-RSRPP measurements are configured.
* Discussion
* Agreements

## RedCap positioning (AI 6.1.1.4 / [112][210] NR\_pos\_enh2\_part1)

### **Issue 2-1: Requirement on N\_(hops,effect)for RedCap positioning core requirements**

* Proposals
  + Option 1: HW
    - Update the requirement on as

where

* + - * is the index of hops within an MG instance
      * is the number of unmuted PRS repetitions that overlaps with the sampling window of hop ,
      * if = 2, otherwise .
* **Discussion in AH2:**

Postpone the issue, come back.

Further off-line discussion is needed.

* **Discussion in AH3**
* Agreements

### **Issue 2-2: Requirement on N\_hop for RedCap positioning core requirements**

* Proposals
  + Option 1: HW
    - Update the requirements on by adding an upper bound for N3 capability
      * .
* **Discussion in AH2:**
  + Postpone the issue, come back.
  + Further off-line discussion is needed.
* **Discussion in AH3**
* Agreements

### **Issue 2-3: Requirement on L\_prs for RedCap positioning core requirements**

* Proposals
  + Option 1: HW
    - Update the requirements on by considering measurement of different PRS resources in different MG occasions
      * .
* Discussion in AH2:
  + Qualcomm: Further discussion is needed, the proposal is not complete.
  + Postpone the issue, come back.
* Discussion
* Agreements

## PRS/SRS bandwidth aggregation (Agenda 6.1.1.4)

### **Issue 3-1: Considerations for interruption length for SRS aggregation for positioning**

* Proposals
  + Option 1: CATT
    - Interruption length is derived by: guard period + SRS transmission + guard period.
  + Option 2: HW
    - For interruption requirements for SRS BWA on CC without PUCCH/PUSCH,
      * SRS is transmitted only if SRS duration plus guard period before and after does not collide with other UL transmission or DL reception with higher priority as defined by RAN1 on victim cells
      * SRS is transmitted only if SRS duration plus guard period before and after does not collide with any NR L3 or L1 measurement on victim cells
      * The victim cells are given by 41-4-9
      * The interruption length is defined on symbol level as 2\*guard period + SRS duration, where the guard period is indicated via component 9 of 41-4-7
* Discussion in AH2:
  + Postpone the issue, come back.
  + Further off-line discussion is needed.
* Discussion
* Agreements

### **Issue 3-2: Values of interruption length**

* Proposals
  + Option 1: CATT
    - The interruption lengths for SRS aggregation with aggressor cell(s) in FR1 are defined as.

Table 1: Interruption length X1 (slot)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | NR Slot length  (ms) of victim cell | Guard period  (us) Note 1 | Interruption length X1 (slots) | |
| SCS for aggressor cell (kHz) | |
| 15 | 30 |
| 0 | 1 | ≤ 200 | 1 | 1 |
| 1 | 0.5 | 0, 30 | 1 | 1 |
| 100, 140 | 2 | 1 |
| 200 | 2 | 2 |
| 2 | 0.25 | 0 | 2 | 1 |
| 30 | 2 | 2 |
| 100, 140 | 3 | 2 |
| 200 | 4 | 3 |
| 3 | 0.125 | 0 | 4 | 2 |
| 30 | 4 | 3 |
| 100 | 5 | 4 |
| 140 | 6 | 4 |
| 200 | 7 | 5 |
| 5 | 0.03125 | 0 | 13 | 7 |
| 30 | 15 | 9 |
| 100 | 20 | 13 |
| 140 | 22 | 16 |
| 200 | 26 | 20 |
| 6 | 0.015625 | 0 | 26 | 13 |
| 30 | 30 | 17 |
| 100 | 39 | 26 |
| 140 | 44 | 31 |
| 200 | 52 | 39 |
| Note1: Guard period is UE capability indicated by *guardPeriod* in *NR-UL-SRS-Capability*. | | | | |

* + - The interruption lengths for SRS aggregation with aggressor cell(s) in FR2are defined as.

Table 2: Interruption length X2 (slot).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | NR Slot length  (ms) of victim cell | Guard period  (us) Note 1 | Interruption length X2 (slots) | | |
| SCS for aggressor cell (kHz) | | |
| 60 | 120 | 480, 960 |
| 0 | 1 | ≤ 200 | 1 | 1 | 1 |
| 1 | 0.5 | ≤ 140 | 1 | 1 | 1 |
| 200 | 2 | 1 | 1 |
| 2 | 0.25 | 0 | 1 | 1 | 1 |
| 30 | 1 | 1 | 1 |
| 100 | 2 | 1 | 1 |
| 140 | 2 | 2 | 2 |
| 200 | 3 | 2 | 2 |
| 3 | 0.125 | 0 | 1 | 1 | 1 |
| 30 | 2 | 1 | 1 |
| 100 | 3 | 2 | 2 |
| 140 | 4 | 3 | 3 |
| 200 | 5 | 4 | 4 |
| 5 | 0.03125 | 0 | 4 | 2 | 1 |
| 30 | 6 | 4 | 3 |
| 100 | 10 | 8 | 7 |
| 140 | 13 | 11 | 10 |
| 200 | 17 | 15 | 14 |
| 6 | 0.015625 | 0 | 7 | 4 | 1 |
| 30 | 11 | 8 | 5 |
| 100 | 20 | 16 | 14 |
| 140 | 25 | 22 | 19 |
| 200 | 33 | 29 | 27 |
| Note1: Guard period is UE capability indicated by *guardPeriod* in *NR-UL-SRS-Capability*. | | | | | |

* + Option 2: E///
    - Interruption requirements for SRS transmission with BW aggregation on CC without PUSCH/PUCCH are defined based on the existing SRS carrier switching framework only.
    - Interruption requirements are defined separately for UEs supporting guard period values {0µs, 30µs, 100µs} and UEs supporting guard period values {140µs, 200µs}.
* Discussion in AH2:
  + Postpone the issue, come back.
  + Further off-line discussion is needed.
* Discussion
* Agreements

### **Issue 3-3: Core requirement for RSTD measurement**

* Proposals
  + Option 1: HW
    - In PRS BWA requirements for , replace the margin as .
* Discussion in AH2:
  + Ericsson: the proposal is not aligned with the agreed signalling.
  + Further off-line discussion is needed.
  + Come back.
* Discussion
* Agreements

## Carrier phase positioning (AI 6.1.1.2 / [112][211] NR\_pos\_enh2\_part2)

### **Issue 2-1-1: Measurement period requirements for DL RSCP/DL RSCPD with aperiodic time window**

* Proposals
  + Option 1a: (CATT)
    - When an aperiodic time window is configured, the measurement period requirements of CPP is upper-bounded by the duration of this time window.
  + Option 1b: (Nokia)
    - RAN4 to specify measurement requirements for aperiodic time window, defined in the LPP spec, and to set the measurement period equal to the duration of the time window.
  + Option 2: (Huawei)
    - When aperiodic time window is configured and UE support FG 41-2-3,
      * the measurement period for CPP is ,
      * the measurement period for RSTD/Rx-Tx is ,
      * is the time from the start of the measurement to the start of the time window,
      * is the processing time for PFL i,
      * is the legacy requirements for RSTD and Rx-Tx.
  + Option 3: (Ericsson)
    - Aperiodic time window for CPP measurement is not supported and therefore no corresponding requirement for CPP measurement is defined.
* Discussion in AH2:
  + HW: Aperiodic time window=one-short window in the above options.
  + Further discussion is needed on the options.
  + Come back.
* Discussion
* Agreements

1. Topic #7: CRs and other documents for approval

## Core draft CRs for all threads

### General (AI 6.1.1.1)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
|  | Big CR to 38133 for RRM core part for expanded and improved NR positioning | Ericsson |  | New document (post meeting): R4-241xxxx |

### RedCap positioning (AI 6.1.1.4)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2411330**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411330.zip) | Draft CR on core requirements for RedCap positioning | CATT | Sections: 5.6A.4.5, 5.6A.5.5, 5.6A.5.6, 5.6A.6.5, 5.6A.6.6.  Changes to 5.6A.5.6 and 5.6A.5.6 overlap with R4-2412682 (Ericsson) – the overlapping changes to 5.6A.5.6 and 5.6A.6.6 will be removed from R4-2412682. | Can be endorsed? |
| [**R4-2412648**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412648.zip) | draftCR on RRM requirements for RedCap positioning | Huawei, HiSilicon | Sections: 9.9A.2.6.1  9.9A.3.6.1  9.9A.4.8.  Changes proposed to 9.9A.2.6.1, 9.9A.3.6.1 and 9.9A.4.8 do not overlap with other CRs (Ericsson CR R4-2412682), but changes need agreement first. | Return to? Agreement needed. |
| [**R4-2412682**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412682.zip) | draftCR 38.133 Core requirement for RedCap positioning | Ericsson | Sections: 4.6.2.6, 4.6.3.6, 5.6A.4.6, 5.6A.5.6, 5.6A.6.6, 9.9A.2.6.1, 9.9A.3.6.1, 9.9A.4.8.  5.6A.5.6 and 5.6A.5.6 overlap with R4-2411330 (CATT).  Remove changes to 5.6A.5.6 and 5.6A.6.6 - these are captured in R4-2411330. Other changes are fine? | Revise. Check if other changes are fine: 4.6.2.6, 4.6.3.6, 5.6A.4.6, ~~5.6A.5.6,~~ ~~5.6A.6.6~~, 9.9A.2.6.1, 9.9A.3.6.1, 9.9A.4.8. |
|  |  |  |  |  |

### PRS/SRS bandwidth aggregation (AI 6.1.1.4)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2411331**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411331.zip) | Draft CR on interruption requirements for SRS BW aggregation | CATT | Sections: 8.2.2.2.21, 5.6.4.2, 5.6.4.6, 9.9.2.2.  Changes to 8.2.2.2.21 depend on agreement during the meeting. Other changes in CR are not based on the latest version of the specification. | Return to for 8.2.2.2.21 – Ok?  Changes to over sections are to implement changes from RAN4#111. |
| [**R4-2412649**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412649.zip) | draftCR on requirements for PRS BWA | Huawei, HiSilicon | Sections: 9.9.2.10, 9.9.4.9.  Changes proposed to 9.9.2.10 and 9.9.4.9 do not overlap with other CRs, but changes need agreement first | Return to? Agreement needed. |

### SL positioning (AI 6.1.1.2)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2412644**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412644.zip) | draftCR on RRM requirements for SL positioning | Huawei, HiSilicon |  | Return to (agreement needed) |
| [**R4-2413387**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2413387.zip) | Draft CR 38133 on remaining core issues for SL positioning | Ericsson |  | Return to (agreement needed) |

### Carrier Phase positioning (AI 6.1.1.2)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2411333**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411333.zip) | Draft CR on core requirements for CPP | CATT | Sections: 4.5.5.5, 5.6.7.5, 5.6.8.5.  Some changes require agreement and other changes are not based on the latest version of the specification | Return to for 4.5.5.5, requires agreement. |
| [**R4-2412645**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412645.zip) | draftCR on RRM requirements for CPP | Huawei, HiSilicon | Sections: 4.5.5.5.  Depends on the agreement. This CR and R4-2411333 may need to be merged as they have changes for the same issue. | Return to for 4.5.5.5, requires agreement. |
| [**R4-2412679**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412679.zip) | draftCR 38.133 Core requirement for CPP | Ericsson | Sections: 4.5.5.3, 4.5.5.5, 5.6.7.3, 5.6.7.5, 5.6.8.3, 5.6.8.5, 9.9.7.3, 9.9.7.5, 9.9.8.3, 9.9.8.5. Revise to capture only changes to 4.5.5.3, 5.6.7.3, 5.6.8.3, 9.9.7.3, 9.9.8.3, which are agreeable. Changes to other sections shall be removed. | Revise: R4-241xxxx |

### LPHAP (AI 6.1.1.3)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Old TDoc** | **Title** | **Source** | **Comments** | **Recommendation/decision** |
| [**R4-2411332**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2411332.zip) | Draft CR on LPHAP core requirements | CATT | Sections: 5.6.6.3 (looks Ok), endorsed but not implemented changes: 7.1.2.4, 5.6.3.5, 5.6.4.5. | Can be endorsed |
| [**R4-2412646**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412646.zip) | draftCR on RRM requirements for LPHAP | Huawei, HiSilicon |  | Can be endorsed |
| [**R4-2412680**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_112/Docs/R4-2412680.zip) | draftCR 38.133 Core requirement for LPHAP | Ericsson | Sections: 4.5.1. | Can be endorsed |